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College Self-Study WICHE

VI. Projecting Student Enrollments

. John K. Folger

This will be a discussion of enrollment projections for individual colleges and universities. The related problems of national, regional, and state projections of enrollment will not be considered specifically, and we will assume that a state level projection is available to assist with the institutional projection.

The techniques for making enrollment projections are not in any sense a substitute for judgment and knowledge of your institution. They can be an important aid to judgment, and can insure that you look beyond the surface at some of the underlying factors involved. Elaborate statistical manipulations may give the impression of accuracy, but they will be no more accurate than the assumptions on which they are based. The assumptions depend essentially on your judgment, and if your judgment is bad, your projections will be bad.

Now in a technical sense, a projection cannot be "bad" or "good," since it is merely a statement of what will happen under certain conditions. But everyone persists in regarding them as predictions; why would you make them if you weren't interested in the future? So, although you should be careful to point out the assumptions on which your projections are based, do not expect that this will protect you if they go astray. If they are accurate, people will regard them as good; if they are inaccurate, people will regard them as bad.

A recent experience may illustrate the function of judgment in enrollment projections. Several years ago, the Southern Regional Education Board prepared a series of projections of public school enrollments for each of the Southern states. We got the advice of expert consultants and prepared a careful set of statistical projections, using the best procedures we could, and uniform assumptions for all states.

Several of the states had already made projections of their own, so it was possible to compare their work and our work with the actual enrollment as it entered school in the next few years. In North Carolina, the projections made by the person in the state were always more accurate than ours were--and usually missed the actual enrollment by less than $\frac{1}{2}$ of 1 per cent. We checked with the statistician in North Carolina to find out what method he used, and he said he didn't use any "method" at all. He just took the data for the preceding year

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and studied it, and using his knowledge of the events in the state, worked out projections for the next year or two.

This experience illustrated for me the value of knowledge of your data and what it represents. It suggests that the best role for a statistician who doesn't work continuously with the data may be as consultant and adviser to the person who is actually best informed about the data.

The projection of enrollment for a single college is usually a more difficult job than for a whole state or region because more variables are involved. To make a good projection for a single institution you may need a projection of the enrollment trend in the state, in the region, and even in the nation. But the extent to which these are important depends partly on the kind of institution you have.

Some institutions are highly localized, drawing nearly all their students from the immediate area, sometimes from a commuting area. Others are state and national in scope. If an institution draws students nationally, this usually means that population data and public school enrollment trends in the state or nation will not be helpful to you because national institutions usually select from a fairly limited spectrum of the total students in the country.

Types of Enrollment Projections

There are two principal uses for enrollment projections, and depending on your purpose, you may employ somewhat different procedures. The first use is for budget preparation, and for this purpose a two to four year projection is sometimes all that is required. (Except for capital budgets, where longer range projections may be desirable.) The second use is for long range planning purposes--and here 10 to 20 year projections are usually desired. The uses made of shorter range projections require greater accuracy, but they are often made with less concern for elaborate statistical procedures (as illustrated by our North Carolina friend). Long range projections require you to define a trend line or trend lines to use as the basis of your projections; this will usually lead to more elaborate procedures, but not necessarily to greater accuracy.

If you plot college enrollment for the past 30 years in any state on a graph, and compare it with a graph of public school enrollment, you will observe that the college enrollment fluctuates a great deal more. There are more irregularities in the data. Since enrollment in college is much more a matter of individual choice than public school enrollment, the greater variability of the data is easily understandable. You have to accept this and be prepared for wider margins of error in your projections of college enrollment. Before considering the sources of fluctuation in enrollment in detail, a few words need to be said

about the dull but important problems of defining enrollment. It's an important topic because we have so many definitions of a student, and they mean such different things.

Problems of definition of enrollment have bothered individual institutions, but are even more bothersome to people who are trying to put data together for a group of institutions in a state-wide, regional, or national projection. The definition of enrollment that the Census Bureau uses, for example, is not comparable with that of the Office of Education. This does not mean that either one is intrinsically better than the other; it's just that they are different concepts.

Census data is collected by enumerators visiting either a sample of homes, or every home every ten years, and mostly the information is collected from the family. If you look in the census volumes at your age-grade tables, and the census has age-grade tables for each state, you will find an upward bias in the census data. It reports people at a higher grade level than the enrollment statistics that you get from the school systems. There seems to be a natural tendency for people to overstate the grade in which a person is enrolled; part of this is perhaps due to misunderstanding, but it is also because census information usually is not collected from the individual but from the head of the household. You will find more people reported as seniors in high school by the census than you will from the state department of education in your own state and fewer people in other grades. Overall, the census figures are usually about three to ten per cent less than the enrollment figures in the state.

Enrollment figures from Office of Education reports are based on several concepts. The Office of Education describes these, and you need to be careful in using Office of Education data to know which type of enrollment is reported. "Total enrollment," which includes all the students who were enrolled during the entire year, isn't comparable with "fall enrollment" (a smaller amount) which refers to the number of students in the third week of the fall term.

The kind of figure that you want to project depends on your purposes. If you are interested in operational costs of the instructional program, you may be a good deal more interested in a "student credit hour equivalent" projection than in a "head count" projection of the total number of people, both full and part-time, that will be enrolled. There is a good discussion of different concepts of enrollment in the booklet by Calvin Schmid of the Washington State Census Board, Enrollment Forecasts in the State of Washington, 1957-1965. Chapter 8 of this booklet discusses definitional problems and provides illustrative statistics.

Schmid discusses regular resident enrollment, the full-time student equivalent based on credit hours, and non-credit enrollment, and he develops projections for the state of Washington for all three of these

concepts. It is interesting to note that some types of enrollment are almost completely absent in some of the Washington colleges; that is, some had no part-time students, while others may have many more part-time or non-credit students than they have full-time or credit students.

Factors Affecting Enrollment Forecasts

Let me return to the variables which affect enrollment projections for any college. To the extent that we can identify and measure each source of variation, our projections should be improved.

The first, and one of the most important factors affecting enrollment, is the size of the college age population. We know a good deal about the way that the college age group is changing, and if we limit our projections to an 18 year period we are dealing with people who are already born. Our college age population projections are very accurate for the nation as a whole, somewhat less accurate (but still pretty accurate) for individual states, and are not very accurate for small areas such as counties. Migration is the factor that decreases the accuracy of projections for smaller areas.

A very useful set of projections of the college age population has been prepared by the Census Bureau in their P-25 series, Number 132. This leaflet gives projections of the total 18 to 24 year old population at five-year intervals between 1958 and 1973 for each state. Three different migration assumptions are provided. In some rapidly growing states like Florida, Nevada, and California you will find that if you take the assumption of no migration and the assumption of a continuation of the rate and amount of migration that occurred between 1940 and 1950 and use these in a projection to 1973, the migration assumption figures will be nearly twice as large as those assuming no migration.

The Southern Regional Education Board took these Census data and broke them down into greater detail--into single years of age--and prepared projections for each year from 1958 to 1973. If you have a junior college and are primarily interested in the 18 to 19 year old group you will want projections of those ages. If you have a liberal arts college which has a predominantly young student body you may be most interested in the 18-21 year old group. And if you have a university you would probably want to use 18-24 year old group as a base for projections. This same kind of breakdown can be done for any of the states. It is a job which you could do yourself, or if you have an economist or demographer on your faculty, he could probably make the appropriate breakdown for you.

Getting good projections of the college age population for areas smaller than a whole state are difficult. I would advise you, if you need to prepare college age population projections for a small area of the state, that you get the advice of a demographer or economist who is accustomed to working with this kind of information.

Another factor which has been more important than the college age population in the last five or six years of growth in college enrollment has been the growth in the number of high school graduates and the changes in the proportion of youth who want to go on to college. In the period between 1952 and the present there has been very little increase in the total size of the college age population in the country as a whole. In fact, the college age population is just now beginning to rise rapidly. The birth rate really didn't go up sharply until World War II began and its major climb was in 1947 and subsequently. The impact of the increased birthrate on the colleges is still largely in the future. In the 1952-57 period, however, when the college age population grew hardly at all, college enrollment rose over forty per cent in the nation. Most of this is attributable to an increased desire of people to attend college.

In most states very good data can be obtained on the number of high school graduates, and this can usually be obtained for each school system in the state. If your institution draws most of its students from a small part of the state, you can get information about the number of high school graduates in the service area of your institutions; something you can't do easily with the college age population. In some instances, you can obtain projections of future high school graduations for the state or for school systems.

After you have information on the college age population and the number of high school graduates, you come to the really interesting variables that will affect your projections. They are also the most complicated, and the ones we know the least about.

Who wants to go to college? Among those who don't want to go, what might change their minds? Who among those who start out to college will never get there? What effects would a major shift in the economy have on college entrance? What will be the effect of opening a new college nearby? Of higher tuition in other institutions?

To answer these questions we need a number of studies about who goes to what college. How are choices made among colleges? What proportion of your students are drawn from upper income groups. From lower income groups? Studies such as those reported earlier by Ken Little and Paul Heist should be very helpful in giving us a better picture of who our students are and why they make the choices they do.

Any institution attracts a certain segment of all college students in competition with other colleges and universities. The curriculum, the amount of tuition and other costs, the prestige of the school--all these affect its drawing power. An institution cannot study its drawing power by itself, because it needs to know about the students who chose other colleges, as well as those that chose it. There have been very few studies of these questions. Dr. Cowan of New York State, for example, studied various socio-economic factors in relation to college attendance and also the relation of distance to college attendance.

The size of the college age group, the number of high school graduates, the socio-economic status of potential students, their educational aspirations, all of these and more are variables affecting enrollment projections.

Three Approaches to Enrollment Projection

There are three interrelated approaches to enrollment projection.

The first of these techniques is "cohort analysis," in which a grade (or age) group is "survived" through the college years. By adding up all the cohorts that are supposed to be in college in a given year the total enrollment can be estimated. For example, one could count the number of pupils in the ninth grade in a state and, allowing for drop outs, death, etc., "survive" some portion of this cohort group through the 12th, 14th, and 16th grades.

The second technique is the "ratio to population" analysis. Here you begin with a projection of the college age population, and by estimating the future proportion of the age group that will be in college, you can make a projection of college enrollment.

The third technique is an elaboration of the first two called "component analysis." It is based on the notion that sub-groups of the population have different patterns of college attendance. For example, girls attend college in smaller numbers than boys. If we separate our data by sex, and make a projection (by either cohort or ratio procedures) for each sex group and then add the two together at the end we have a total projection made by component analysis. It is obviously more work, but should produce more accurate results if you have chosen your components properly.

Cohort analysis should prove more accurate than a ratio projection for a projection of only two or three years. For longer periods, the evidence is not so clear: either may turn out to be superior. Step by step computational procedures for cohort analysis can be found in the booklet by Schmid (referred to above) and also the book by Freedman on Future School and College Enrollments in Michigan. One drawback of cohort analysis is that if an error is made in introducing a cohort into the projections, this error will stay in the projection as long as this cohort is in college. If you introduce too small a group of freshmen into college in 1962, for example, this group will be "survived" through to graduation in 1966, and will affect the projections for all the years between 1962 and 1966. The "survival" rates will not have any effect on this type of error.

The great advantage of the ratio method is its ease and simplicity of computation. If you already have a college age population projection for the state or a part of the state, then the computations for a ratio projection are quite simple. Its simplicity is also one of its drawbacks.

Usually only a single ratio of population and enrollment is projected, and it combines all of the assumptions about the variables described above into one figure--thus eliminating the possibility that you can identify the separate sources of variability in the projections. A good discussion of trend analysis as it can be applied to both ratio and cohort projections is found in Boling and Gardiner's Forecasting University Enrollment. Many texts on economic statistics (Croxtan and Cowden, for example) also contain information on trend analysis.

If you use a component approach, and compute a separate ratio for each component (for example--men, women, high socio-economic status, low socio-economic status, etc.) this eliminates some of the drawbacks of combining all of the variables into one ratio. The component approach can also be used with a cohort analysis of each separate component, rather than a ratio approach.

An Enrollment Projection for "Western College"

In order to make the foregoing rather abstract discussion more concrete, the steps taken in making a projection of the enrollment for a state college will be outlined.

Background. "Western College" is a state-supported institution which offers degrees in liberal arts and teacher education. The liberal arts degrees are new; until two years ago the institution gave degrees only in education. It enrolls about twice as many women as men, primarily because of its curriculum emphasis. Most of the students come from an area of about 10 counties immediately around the college. There is no other state-supported college within 50 miles, although a branch of the state university has been proposed for a nearby small city. There are two private, girls colleges within fifty miles and one private, coeducational junior college.

Step One. A projection of college enrollment for the state was obtained from the state university. A projection of public school enrollment, including high school graduates, was obtained from the State Department of Education, and the census projection of college age population was obtained. Current estimates of the population of counties in the state were obtained from the Bureau of Business Research at the state university. (In most states data comparable to this will be available from various sources.)

Step Two. The primary service area of the college was defined to include the counties supplying two-thirds of the student enrollment. Actually, two-thirds of the enrollment came from eight counties, but two others were included because they supplied almost as many students as several of the eight that were included.

Step Three. Past population and enrollment trends in the state (over the preceding thirty years) and in the primary service area were

studied. The state was growing slowly as a result of a relatively high birthrate and moderate out-migration. The primary service area was, however, growing more rapidly than the state as a whole. It contains several small cities (10,000-25,000) and is being industrialized fairly rapidly.

Step Four. Components were selected for projection. Since the new liberal arts curriculum was thought to be more attractive to boys, it was decided to make separate projections by sex. It was also decided to assume that most of the students would continue to come from the immediate ten county area, since analysis of the past twenty years indicated that the institution had drawn most of its students from this area during the entire period, and also had not increased its proportion of all college enrollment in the state. (Between four and five per cent of all college students in the state have enrolled in "Western.") A separate projection was also made for urban and rural high schools in the primary service area, since past data revealed that "Western" enrolled a large proportion of those rural high school graduates who went anywhere to college, but a smaller per cent of the urban high school graduates. The change in curriculum was thought to make "Western" more attractive as a college to urban high school graduates. (For purposes of this analysis, all high schools in cities of over 10,000 were defined as urban.)

Step Five. A cohort projection of high school graduates in the primary service area was prepared separately by urban and rural high schools and by sex.

Step Six. Projections of the proportions of each of the four subgroups above who would enter "Western" were developed using past trends plus guesses about the effects of the new curriculum on attendance rates.

Step Seven. To these projections were added a constant proportion to allow for students from outside the service area. The total entering group was then "survived" through four years of college to graduation ("Western" offers no graduate work).

Step Eight. The projection was then compared with the projection of college enrollment for the state as a whole and the growth of college age population in the state (data obtained in Step One). Because the projection for "Western" resulted in a rapid rise in the proportion of all college students in the state who went to "Western," it was adjusted downward to provide a more moderate increase.

Step Nine. Alternative projections were prepared, one with conservative assumptions about the per cent of high school youth who would come to "Western," the other with optimistic assumptions. These two alternative projections provide a range of enrollment possibilities which should be helpful in planning.

In summary, these are some of the general considerations and an example of procedures for making an enrollment projection which may be instructive. If you have not prepared a projection before, prepare some projections yourself, and then get some knowledgeable people to criticize them. (Or perhaps you would rather get advice both before you begin and after you finish.) And finally, good luck. You will need some if you are to get good results with your forecasts.